WHAT IS CLAIMED IS:

1. A method for forming an interlayer insulation film for multilayer interconnect of a semiconductor integrated circuit, comprising the steps of:

forming a first insulation film on a substrate by plasma CVD using a first source gas comprising a silicon-containing hydrocarbon gas;

continuously forming a second insulation film on the first insulation film at a thickness less than the first insulation film *in situ* by plasma CVD using a second source gas comprising a silicon-containing hydrocarbon gas and an oxidizing gas; and

subjecting the second insulation film to polishing for forming a subsequent layer thereon.

2. The method as claimed in Claim 1, wherein the first insulation film has a hardness of less than 6 GPa, and the second insulation film has a hardness of no less than 6 GPa.

3. The method as claimed in Claim 1, wherein the first source gas further comprises an oxidizing gas having a flow rate which is less than 1.0 times that of the silicon-containing hydrocarbon gas.

4. The method as claimed in Claim 1, wherein the oxidizing gas in the second source gas has a flow rate which is more than 1.0 times that of the silicon-containing hydrocarbon gas.

5. The method as claimed in Claim 4, wherein the second insulation film is formed under conditions where RF power is reduced and the flow rate of the silicon-containing hydrocarbon is reduced, as compared with those for the first insulation film.

6. The method as claimed in Claim 1, wherein the silicon-containing hydrocarbon in the second source gas has the formula $Si_\alpha O_{\alpha-1} R_{2\alpha-\beta+2}(OC_nH_{2n+1})_\beta$ where α is an integer of 1-3, β is an integer of 0-2, n is an integer of 1-3, and R is C_{1-6} hydrocarbon attached to Si.

7. The method as claimed in Claim 6, wherein the silicon-containing hydrocarbon is dimethy-dimethoxysilane.

8. The method as claimed in Claim 1, wherein the oxidizing gas is at least one selected from the group consisting of oxygen, dinitrogenoxide, ozone, hydrogen peroxide, carbon dioxide, and polyalcohol.

9. The method as claimed in Claim 1, wherein the silicon-containing hydrocarbon gas in the first source gas and the silicon-containing hydrocarbon gas in the second source gas are the same gas.

10. The method as claimed in Claim 1, wherein the first source gas comprises no oxidizing gas.

11. The method as claimed in Claim 1, wherein the second insulation film is composed of multiple layers having different oxygen contents.

12. The method as claimed in Claim 1, further comprising forming via holes and/or trenches in the first and second insulation films, and filling the holes and/or trenches with copper for interconnect, wherein the polishing conducted thereafter is chemical mechanical polishing (CMP).

13. A method for forming an interlayer insulation film for multilayer interconnect of a semiconductor integrated circuit, comprising the steps of:

forming a first insulation film having a hardness of less than 6 GPa and a dielectric constant of less than 3.3 on a wiring layer of a substrate by plasma CVD using a first source gas comprising a silicon-containing hydrocarbon gas without an oxidizing gas; and

continuously forming a second insulation film having a hardness of no less than 6 GPa and a dielectric constant of no less than 3.3 on the first insulation film at a thickness less than the first insulation film *in situ* by plasma CVD using a second source gas comprising said silicon-containing hydrocarbon gas and an oxidizing gas which is included more than the silicon-containing hydrocarbon gas.

14. The method as claimed in Claim 13, further comprising forming via holes and/or trenches in the first and second insulation films, filling the holes and/or trenches with copper for interconnect, and subjecting the second insulation film to chemical mechanical polishing (CMP).

15. An insulation film for multilayer interconnect formed in a semiconductor integrated circuit, comprising:

a first insulation film formed by plasma CVD using silicon-containing hydrocarbon as a source gas, said first insulation film having a hardness of less than 6 GPa and a dielectric constant of less than 3.3; and

a second insulation film formed on the first insulation film by plasma CVD using silicon-containing hydrocarbon gas and oxidizing gas as a source gas, said second insulation film having a hardness of no less than 6 GPa and a dielectric constant of no less than 3.3.

16. The insulation film as claimed in Claim 15, wherein the first insulation film has a hardness of 1.5-2.5 GPa and a dielectric constant of 2.5-3.1.

17. The insulation film as claimed in Claim 15, wherein the second insulation film has a hardness of no less than 6 GPa and a dielectric constant of 3.5-3.9.

18. The insulation film as claimed in Claim 15, wherein the first insulation film has a thickness of 0.3-2.0 μm.

19. The insulation film as claimed in Claim 15, wherein the second insulation film has a thickness of 0.03-0.15 μm.

20. The insulation film as claimed in Claim 15, wherein the second insulation film is a polishing stop layer.

21. The insulation film as claimed in Claim 15, wherein the silicon-containing hydrocarbon has the formula $Si_{\alpha}O_{\alpha-1}R_{2\alpha-\beta+2}(OC_nH_{2n+1})_{\beta}$ where α is an integer of 1-3, β is an integer of 0-2, n is an integer of 1-3, and R is C1-6 hydrocarbon attached to Si.